XE166 Microcontroller Family

Real-Time Signal Controllers for Industrial Applications

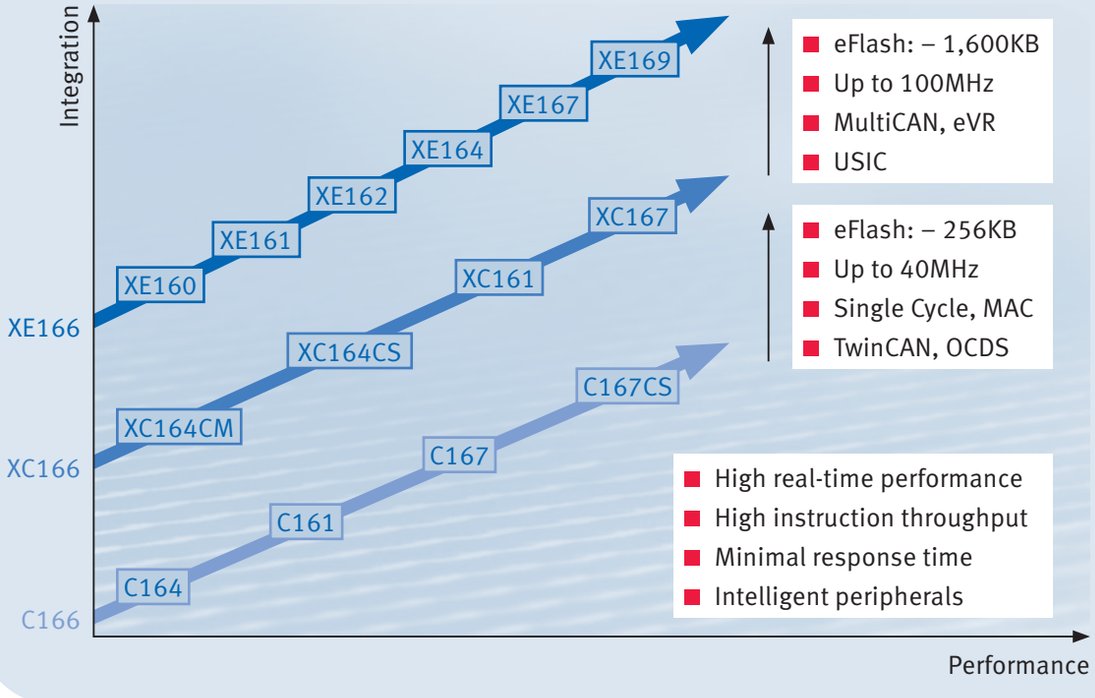
www.infineon.com/XE166

Contents

Evolution

XE166 Family – More Performance, More Flash, Better Peripherals

With more than 500 million units sold, C166 has set the standard for 16-bit architectures with the highest aggregate volume share of all available 16-bit devices. With its fast interrupt response and context switching, the C166 family is ideally suited for automotive, industrial, mass storage and wired as well as wireless communications applications. Compared with the XC166, the XE166 delivers more performance, more Flash memory, more RAM, strongly enhanced peripherals and a complete DSP library.



Real-Time Signal Controller

MCU and DSP in a Real-Time Core

Infineon Technologies' Real-Time Signal Controller (RTSC) combines the traditional strengths of a Microcontroller Unit (MCU) for the control of peripherals with the computing power of Digital Signal Processors (DSPs), all in one enhanced XE166 core. Together, the microcontroller's real-time capability and ease of use and the DSP's mathematical performance and data throughput form a powerful single-chip solution ideal for many embedded applications.

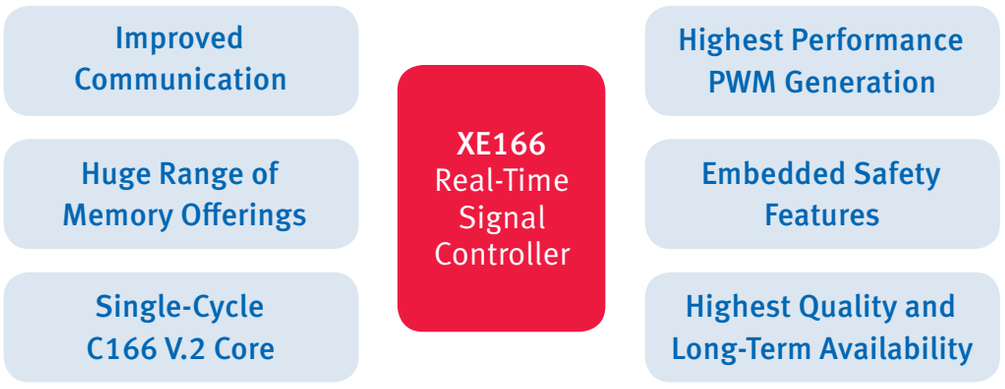
The XE166 Advantage

By choosing Infineon's new RTSC XE166 family, embedded design engineers will benefit from a doubling in performance and a huge range of embedded Flash offerings. Operating at 100MHz and one cycle per instruction, the XE166 delivers 100MIPS, more than twice the performance of its predecessor the XC166 and five times the performance of the fastest C166 MCU.

In addition, the XE166 offers up to six times more Flash than the XC166, with a maximum Flash capacity of 1,600KB. Designers will also improve system performance by up to 138KB RAM.

As well as these primary value generators, the XE166 offers multiple additional benefits to embedded system designers. A very high level of integration, enhanced peripherals such as multiple Capture/Compare Units (CCU) and two new more powerful analog-digital converter modules as well as new and improved communication modules (USIC and MultiCAN). As with all members of the C166 family, the XE166 real-time signal controllers were designed to excel in real-time performance.

Overview



Improved Communication

- Flexible serial interface (USIC) supporting I^2C, I^2S, UART, LIN, SPL, IO-Link
- MultiCAN with up to six independent CAN nodes and 256 message objects

Huge Range of Memory Offerings

- Up to 1,600KB Flash
- Up to 138KB RAM
- External Bus Interface (EBU)

Single-Cycle C166 V.2 Core

- 32-bit MAC unit
- 100 MIPS performance
- Fast interrupt response and switching

Peripheral Event Controller

The Peripheral Event Controller (PEC) enables single cycle data transfers between memory and peripherals without the intervention of an interrupt service routine. The PEC provides eight PEC service channels which move a single byte or word between any two locations with optional automatic updating of the source and destination pointers. A PEC transfer can be triggered by any interrupt service request and is the fastest possible interrupt response.

Interrupt Control

The architecture of the XE166 supports several mechanisms for fast and flexible responses to service requests from various sources internal or external to the microcontroller.

- DMA transfer issued by the PEC
- Priority-level interrupt system with up to 87 sources, selectable external inputs for interrupt generation and wake-up
- 16 interrupt priority levels, each with eight groups for prioritization
- Very short interrupt response time (7/11 cycles minimum)

Highest Performance PWM Generation

- Powerful analog to digital converter (600ns, +/- 2LSB)
- Multiple Capture/ Compare Units (CCU)
- HW synchronization of CCU/ADC

Embedded Safety Features

- Memory Protection Unit (MPU)
- Memory Checker (MCHK, CRC)
- ECC for SRAM and Flash
- ADC broken wire detection

ECC for SRAM and Flash

With the move to smaller and smaller feature sizes, single-bit failures in Flash memory are a fact that no manufacturer can disregard. Infineon has put in place a very effective Error-Correction-Coding (ECC) technology, able to find and correct single-bit errors and detect double-bit errors. When unexpected power disruptions are capable of causing injuries, fatalities, serious business disruption or data loss, designers as well as end-customers will welcome the superior reliability provided by Infineon's microcontrollers in general, and the XE166 real-time signal controllers in particular. In the XE166U, L, N, M and H-Series, Infineon has implemented ECC on all SRAMs as well as an MPU (Memory Protection Unit) to achieve fail-safe operations.

Highest Quality and Long-Term Availability

- Less than 1dppm since 2006
- Typical product life cycle › 10 years
- Guaranteed lifetime in hours

Zero Defect

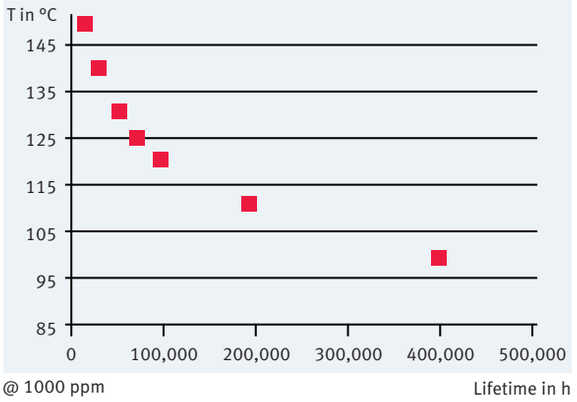
The highest quality standards are not only a must in safety-critical applications, but also help embedded designers to improve end-customer satisfaction by reducing field returns and therefore reducing the cost of not achieving the desired quality. Infineon has implemented a zero-defect quality program which yielded less than 1dppm since 2006.

Long-Term Availability

The long-term availability of electronic components is crucial to industrial applications, where designs can last 10 to 20 years. Infineon's typical product lifetime exceeds 10 years, thus allowing customers to secure long-term planning.

Designed for Harsh Industrial Requirements

The XE166 derivates are designed for industrial applications only. The product lifetime, also specified in the datasheet, is shown below:



XE166 Real-Time Signal Controller

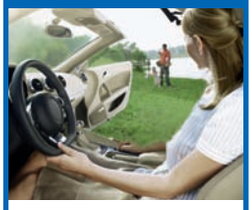
Complete Portfolio from Low-Cost to High-Performance

	TSSOP-38	VQFN-48	QFP-64	QFP-100	QFP-144	QFP-176
1.6MB					XE167xH 100/80MHz	XE169xH 100/80MHz
1MB					XE167xH 100/80MHz	XE169xH 100/80MHz
768KB				XE164x 80/66MHz	XE167x 80/66MHz	
576KB			XE162xM 80MHz	XE164xM 80MHz	XE167xM 80MHz	
384KB			XE162xM 80MHz	XE164xM 80MHz	XE167xM 80MHz	
320KB			XE164xN 80MHz	XE164xN 80MHz		
192KB			XE164xN 80MHz	XE164xN 80MHz		
160KB		XE161xL 80/66MHz	XE162xL 80/66MHz			
128KB		XE161xL 80/66MHz	XE162xN 80MHz	XE164xN 80MHz		
96KB			XE162xL 80/66MHz			
64KB	XE160xU 66/40MHz	XE161xU 66/40MHz				
32KB	XE160xU 66/40MHz					

Classic-Series – Alpha Line
U-Series – Compact Line
L-Series – Econo Line
N-Series – Value Line
M-Series – Base Line
H-Series – High Line

XE166 Microcontroller Family – Scalable and Highly Integrated

Infineon's powerful XE166 series is the standard of 16-bit microcontrollers especially designed to address the requirements of industrial applications. The broad XE166 product portfolio comprises a multiplicity of different products, offering design engineers the scalability to select a micro-controller with the optimal combination of memory, peripheral set, frequency, temperature and packaging – just the right microcontroller to match the application's feature and performance requirements. Compatibility within the families, even within different packages, allows an easy product change during and after the design cycle.

INDUSTRIAL	BODY	SAFETY	POWERTRAIN
			
XE166 MCU and DSP in a Real-Time Signal Controller	**XC2200** Dedicated Features for Body Applications	**XC2300** Dedicated Features for Safety Applications	**XC2700** Dedicated Features for Powertrain Applications
■ Servo Drives ■ Appliance Motors ■ HVAC Compressors and Blowers ■ Stepper Motors ■ Industrial Pumps ■ Transportation ■ Power Supplies	■ Central Body Module ■ Central Gateway ■ HVAC ■ Power Operated Systems ■ Door/Seat Module ■ Lightning ■ E-Call ■ Touch Control	■ Airbag ■ Electric Power Steering (EPS) ■ EHPS ■ Low-end ABS/ESC ■ Belt Pretensioner ■ Driver Assistant Systems	■ Engine Management (gasoline, diesel, LPG) ■ Transmission Management (AMT, ECAT, CVT) ■ Auxillary Module Management ■ Hybrid Applications

XE166 is a full member of the C166v2 microcontroller series with further derivatives targeting automotive applications.

Performance Boost with Instruction Cache – C166v2 at its Best

The Instruction Cache (iCache) integrated on the C166v2 family's new high-end devices offers a strong performance boost.

- 30 % performance boost expected via iCache only
- Additional frequency – improvement of up to 128MHz – generates an additional performance of approximately 50 %
- iCache Flash memory mapping is family-compatible and allows easy software porting
- XE166 family compatible

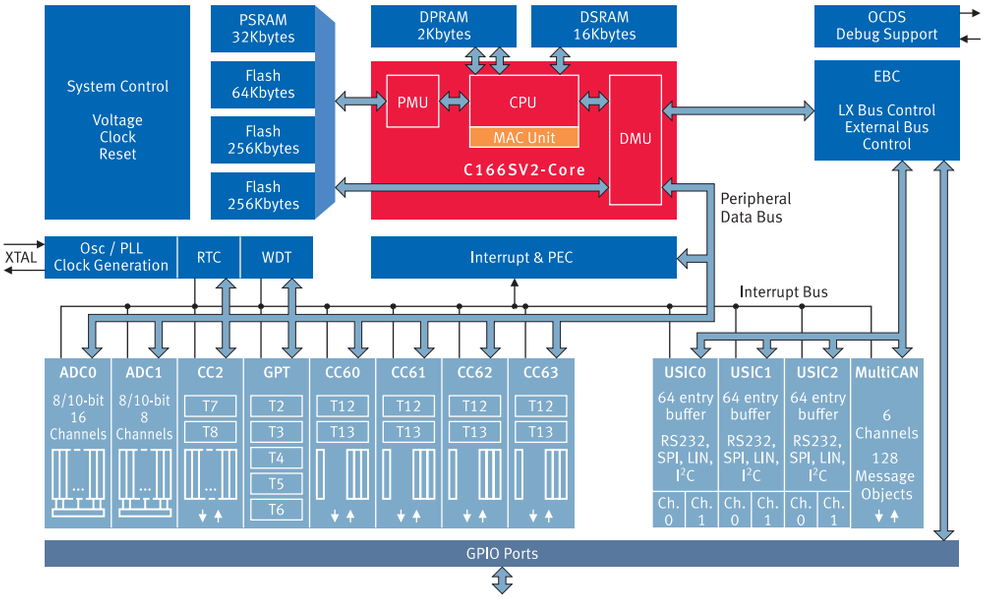
For further information see www.infineon.com/XC2000

XE166 Classic Series – Alpha Line

Key Features

- 80MHz frequency = 80MIPS performance
- 768KB of Flash memory and 82KB of RAM
- Up to four PWM units (CCU6) to drive any industrial 3-phase motor
- Two very fast A/D converters
- Up to six serial interfaces (USIC)

Block Diagram



Overview

Subfamily		Classic Series							
		XE164F	XE164G	XE164H	XE164K	XE167F	XE167G	XE167H	XE167K
Core	Core	C166SV2							
	Frequency (MHz)	80/66							
Package		QFP 100				QFP 144			
Flash	Prog/Data Flash (KB)	768	768	768	768	768	768	768	768
SRAM	Σ SRAM (KB)	24-82	24-82	24-82	24-82	28-82	28-82	28-82	28-82
CAN	Channels	4 (128)	2 (128)	0	0	5(128)	2(128)	0	0
ADC	Channels	16	11	16	11	24	16	24	16
Universal Serial Interface [USIC] Channels*		6	4	6	4	6	4	6	4
Capture Compare Units [CCU]**	CCU 1	0	0	0	0	0	0	0	0
	CCU 2	1	1	1	1	1	1	1	1
	CCU 6	3	2	3	2	4	2	4	2
Temperature (ambient)		-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C

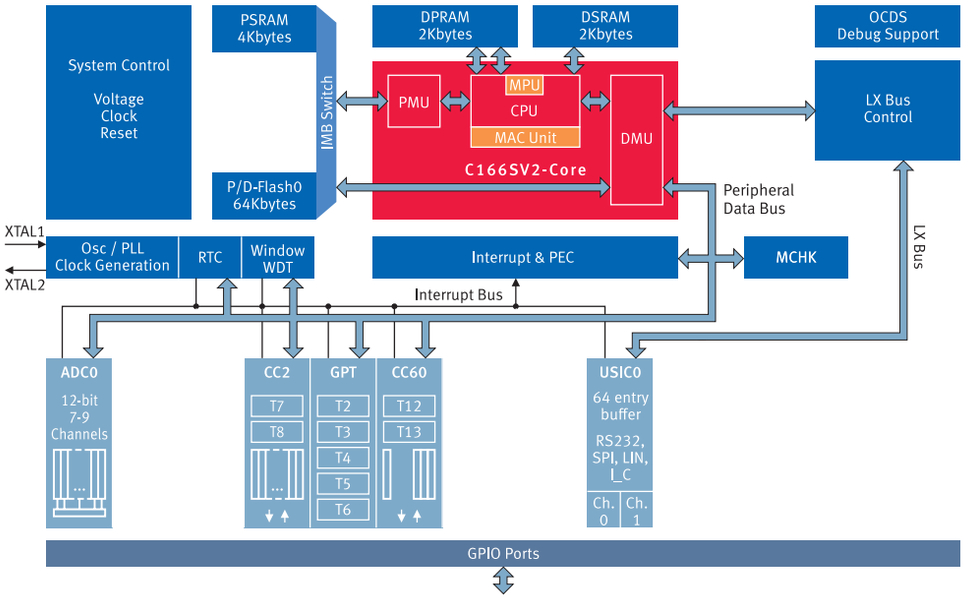
* USIC: can be configured as UART, LIN, SPI, IIC, IIS
** CCU: used for PWM, D/A

XE166xU Series – Compact Line

Key Features

- 66MHz frequency = 66MIPS performance
- Up to 64KB of Flash memory and 8KB of RAM
- PWM unit (CCU6) to drive any industrial 3-phase motor
- 12-bit A/D converter, conversion time below 1µs
- Two serial interfaces (USIC)
- DAP – Device Access Port (two-wire JTAG, replaces five-wire JTAG)
- SPD – single wire JTAG

Block Diagram



Overview

Subfamily		U Series	
		XE160FU	XE161FU
Core	Core	C166SV2	
	Frequency (MHz)	66/40	
Package		TSSOP 38	QFN 48
Flash	Prog/Data Flash (KB)	64	64
SRAM	Σ SRAM (KB)	8	8
CAN	Channels	0	0
ADC	Channels	8	10
Universal Serial Interface [USIC] Channels*		2	2
Capture Compare Units [CCU]**	CCU 1	0	0
	CCU 2	1	1
	CCU 6	1	1
Temperature (ambient)		-40°C to +125°C	-40°C to +125°C

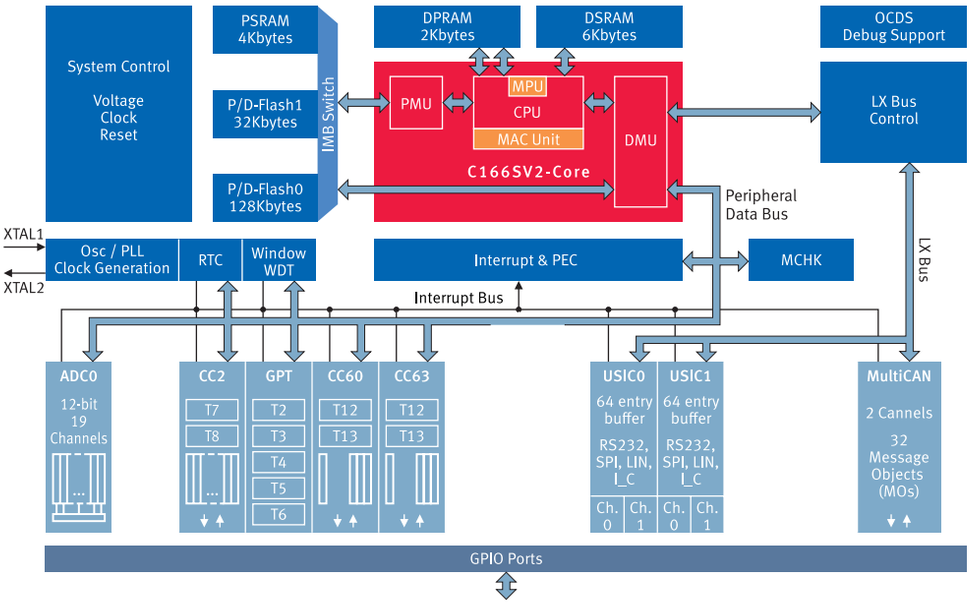
* USIC: can be configured as UART, LIN, SPI, IIC, IIS
** CCU: used for PWM, D/A

XE166xL Series – Econo Line

Key Features

- 80MHz frequency = 80MIPS performance
- Up to160KB of Flash memory and 12KB of RAM
- Parallel Flash programming
- Up to two PWM units (CCU6) to drive any industrial 3-phase motor
- 12-bit A/D converter, conversion time below 1µs
- Up to four serial interfaces (USIC)
- DAP – Device Access Port (two-wire JTAG, replaces five-wire JTAG)
- SPD – single wire JTAG

Block Diagram



Overview

Subfamily		L Series	
		XE161FL	XE162FL
Core	Core	C166SV2	
	Frequency (MHz)	80/66	
Package		QFN 48	QFP 64
Flash	Prog/Data Flash (KB)	160	160
SRAM	Σ SRAM (KB)	12	12
	Program [PS RAM]	4	4
	Data Mem [DS RAM]	6	6
	Dual Port [DP RAM]	2	2
CAN	Channels	1 (32)	2 (32)
ADC	Channels	10	19
Universal Serial Interface [USIC] Channels*		4	4
Capture Compare Units [CCU]**	CCU 1	0	0
	CCU 2	1	1
	CCU 6	2	2
Temperature (ambient)		-40°C to +125°C	-40°C to +125°C

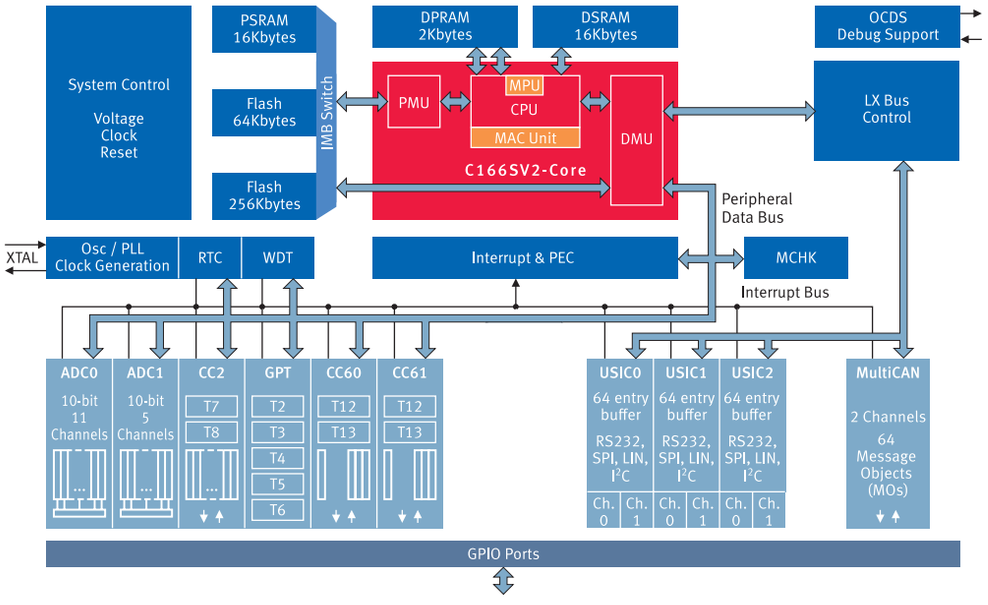
* USIC: can be configured as UART, LIN, SPI, IIC, IIS
** CCU: used for PWM, D/A

XE166xN Series – Value Line

Key Features

- 80MHz frequency = 80MIPS performance
- Up to 320KB of Flash memory and 34KB of RAM
- Parallel Flash programming
- Up to two PWM units (CCU6) to drive any industrial 3-phase motor
- Two very fast A/D converters
- Up to six serial interfaces (USIC)
- DAP – Device Access Port (two-wire JTAG, replaces five-wire JTAG)

Block Diagram



Overview

Subfamily		N Series					
		XE162FN	XE162HN	XE164FN	XE164GN	XE164HN	XE164KN
Core	Core	C166SV2					
	Frequency (MHz)	80					
Package		QFP 64		QFP 100			
Flash	Prog/Data Flash (KB)	128-320	128-320	128-320	128-320	128-320	128-320
SRAM	Σ SRAM (KB)	26-34	26-34	26-34	26-34	26-34	26-34
CAN	Channels	2 (64)	0	2 (64)	2 (64)	0	0
ADC	Channels	9	9	16	11	16	11
Universal Serial Interface [USIC] Channels*		6	6	6	4	6	4
Capture Compare Units [CCU]**	CCU 1	0	0	0	0	0	0
	CCU 2	1	1	1	1	1	1
	CCU 6	1	1	2	2	2	2
Temperature (ambient)		-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C

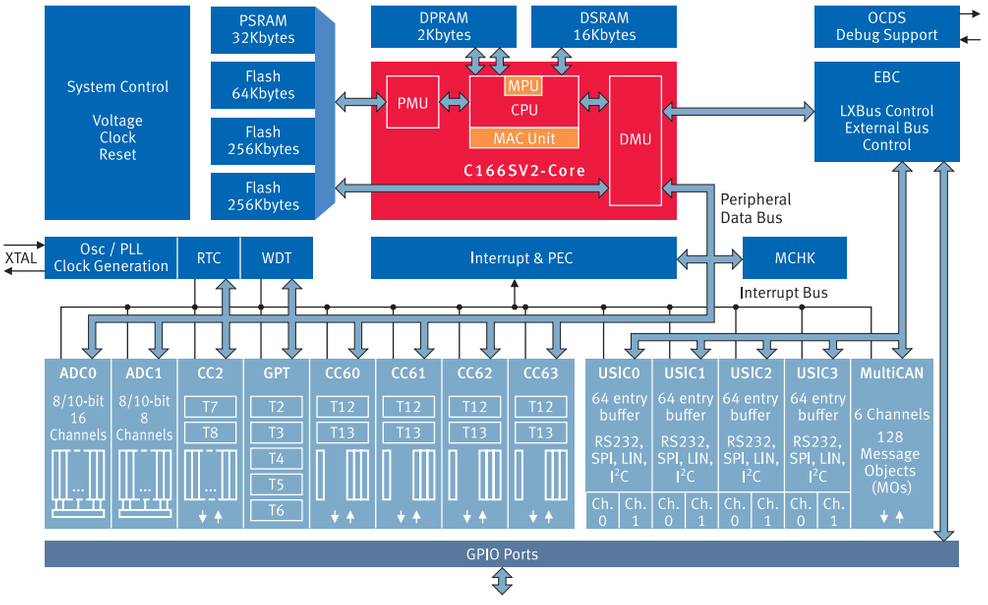
* USIC: can be configured as UART, LIN, SPI, IIC, IIS
** CCU: used for PWM, D/A

XE166xM Series – Base Line

Key Features

- 80MHz frequency = 80MIPS performance
- Up to 576KB of Flash memory and 50KB of RAM
- Parallel Flash programming
- Up to four PWM units (CCU6) to drive any industrial 3-phase motor
- Two very fast A/D converters
- Up to eight serial interfaces (USIC)
- DAP – Device Access Port (two-wire JTAG, replaces five-wire JTAG)

Block Diagram



Overview

Subfamily		M Series									
		XE-162FM	XE-162HM	XE-164FM	XE-164GM	XE-164HM	XE-164KM	XE-167FM	XE-167GM	XE-167HM	XE-167KM
Core	Core	C166SV2									
	Frequency (MHz)	80									
Package		QFP 64		QFP 100				QFP 144			
Flash	Prog/Data Flash (KB)	384-576	384-576	384-576	384-576	384-576	384-576	384-576	384-576	384-576	384-576
SRAM	Σ SRAM (KB)	24-50	24-50	26-50	26-50	26-50	26-50	34-50	34-50	34-50	34-50
CAN	Channels	2 (64)	0	4(128)	2 (64)	0	0	6(128)	2 (64)	0	0
ADC	Channels	9	9	16	11	16	11	24	16	24	16
Universal Serial Interface [USIC] Channels*		6	6	6	4	6	4	8	4	8	4
Capture Compare Units [CCU]**	CCU 1	0	0	0	0	0	0	0	0	0	0
	CCU 2	1	1	1	1	1	1	1	1	1	1
	CCU 6	1	1	3	2	3	2	4	2	4	2
Temperature (ambient)		-40°C to +85°C	-40°C to +85°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C

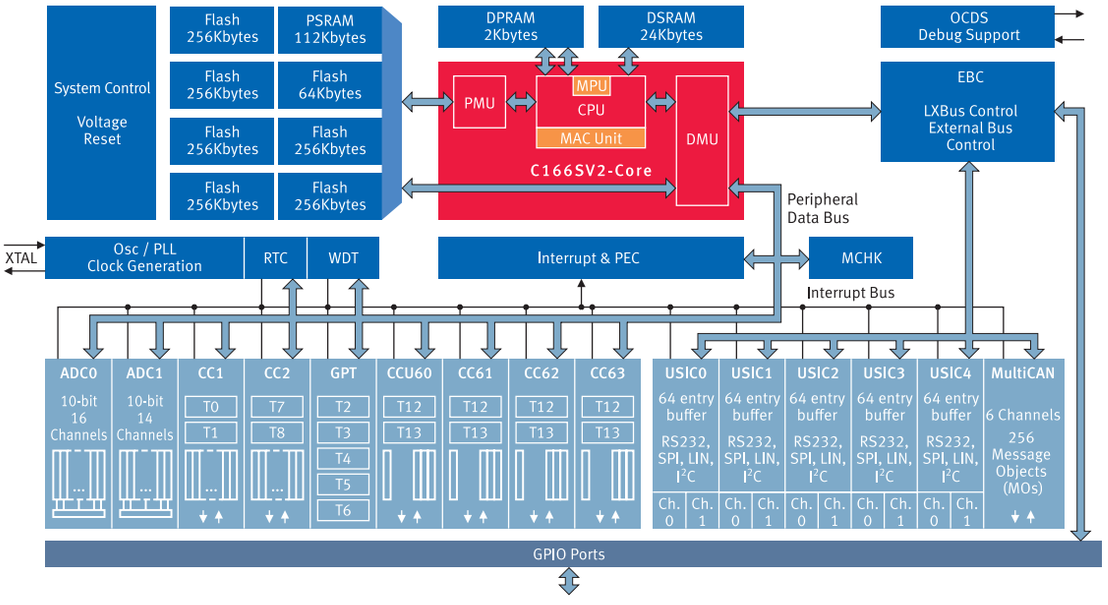
* USIC: can be configured as UART, LIN, SPI, IIC, IIS
** CCU: used for PWM, D/A

XE166xH Series – High Line

Key Features

- 100MHz frequency = 100MIPS performance
- Up to 1600KB of Flash memory and 138KB of RAM
- Parallel Flash programming
- Up to four PWM units (CCU6) to drive any industrial 3-phase motor
- Two very fast A/D converters
- Up to ten serial interfaces (USIC)
- DAP – Device Access Port (two-wire JTAG, replaces five-wire JTAG)

Block Diagram



Overview

Subfamily		H Series	
		XE167FH	XE169FH
Core	Core	C166SV2	
	Frequency (MHz)	100	
Package		QFP 144	QFP 176
Flash	Prog/Data Flash (KB)	1024/1600	1024/1600
SRAM	Σ SRAM (KB)	138	138
	Program *[PS RAM]*	112	112
	Data Mem *[DS RAM]*	24	24
	Dual Port *[DPRAM]*	2	2
CAN	Channels	6 (256)	6 (256)
ADC	Channels	24	30
Universal Serial Interface [USIC] Channels*		10	10
Capture Compare Units [CCU]**	CCU 1	0	1
	CCU 2	1	1
	CCU 6	4	4
Temperature (ambient)		-40°C to +125°C	-40°C to +125°C

* USIC: can be configured as UART, LIN, SPI, IIC, IIS
** CCU: used for PWM, D/A

Renewable Energies

Transportation

Building Control

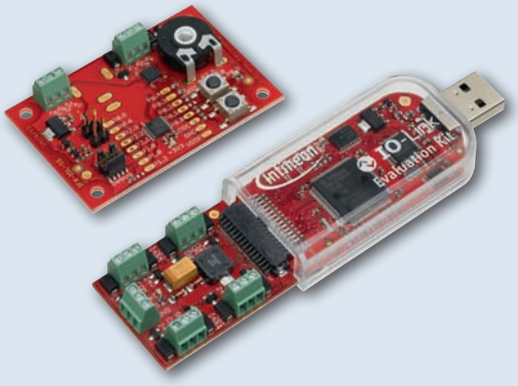
Automation

IO-Link

IO-Link Evaluation Kit for Slave and Master

Key Features

- Low-cost USB format
- All cables included
- USB format 16-bit XE164-based master node
  - Four IO-Link channels
  - Real-time high-performance 16-bit MCU with DSC
  - ADC, CAN, PWM
  - SPI
- Separate low-cost 8-bit XC822-based slave node
  - ADC, MDU coprocessor, PWM
  - SPI
- Keil Toolchains
- Evaluation IO-Link master and slave stack from TMG
- ZMD IO-Link Phy ZIOL 2401
- Demos and tutorials

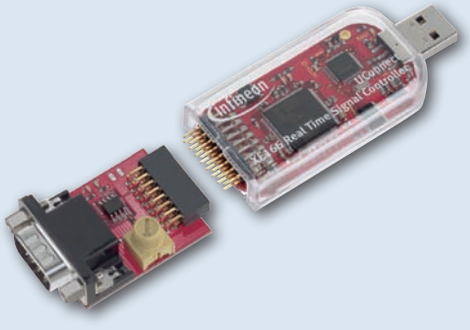


www.infineon.com/io-link

UConnect XE162N supporting CANopen

Key Features

- Low-cost USB stick format provides a single evaluation platform for the XE166 family 16-bit microcontrollers
- Complete toolchain support for the XE166, free Compiler Development Suite
- Access to hardware signals through a 16-pin connector for evaluating the key features of the 16-bit XE162N microcontroller: CAN, ADC, CAPCOM6E and two USIC channels (UART, SPI and IIC)
- Easy installation with demos (CANopen EVA version) and tutorials for ease of use and quick evaluation of key features



www.infineon.com/UConnect-XE162

Automation/Motor Control

Medical

Power Supplies

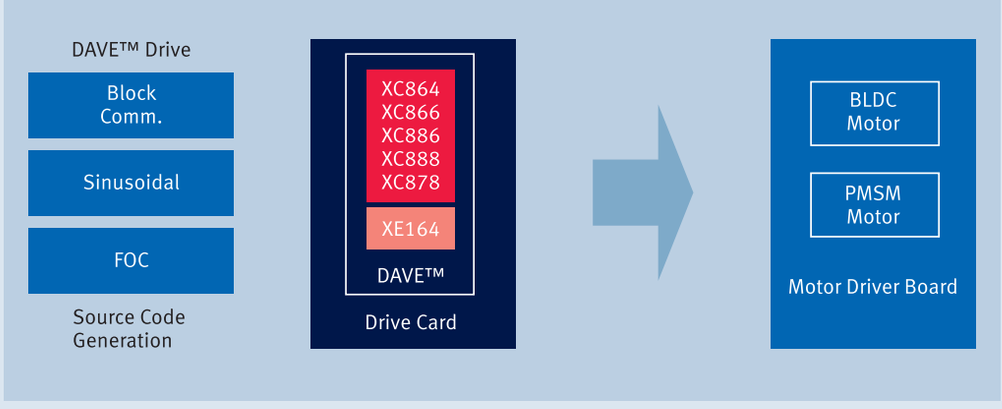
Motor Control

DAVE™ Drive – Application Code Generator for Motor Control

DAVE™ Drive is an auto-code generator which provides application code for a complete motor control system.

Benefits

- Significantly shortens the evaluation time for motor control developers as the motor control code can be generated via a GUI instead of writing thousands of lines of code by hand
- Generates optimized code and is not based on static libraries
- Configures Infineon's powerful and flexible motor control peripherals
- Compresses a detailed user manual into a few mouse clicks
- Helps designers to quickly and easily implement advanced motor control techniques on low-cost components
- Is pre-configured for Infineon's 3-phase high voltage Motor Drive Application Kits (KIT_AK_3PHASE_DRIVE_V1) and the low voltage DAVE™ Drive Application Kit (KIT_AK_DaveDrive_V3)



Key Features

- Shortens the evaluation time as
  - Motor control code can be generated via a GUI
  - Gives hardware engineers easy access to electronic systems
  - Generates optimized FOC code
- Available for free

www.infineon.com/DAVEdrive

Renewable Energies

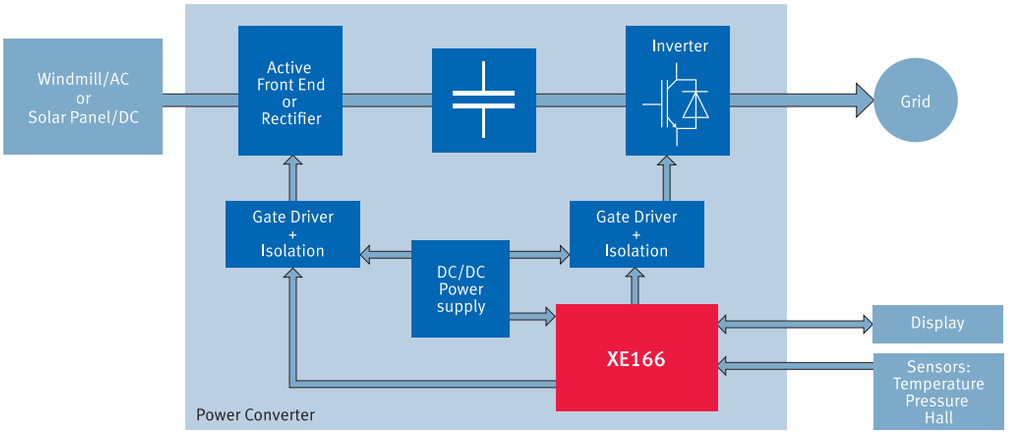
Power Converter Solutions AC/DC and DC/AC

- Photovoltaic
- Battery storage
- Fuel cells

Power Converter Solutions AC/AC

- Wind energy converter
- Small hydro
- Combined heat and power
- Micro turbines

Application Example



Transportation

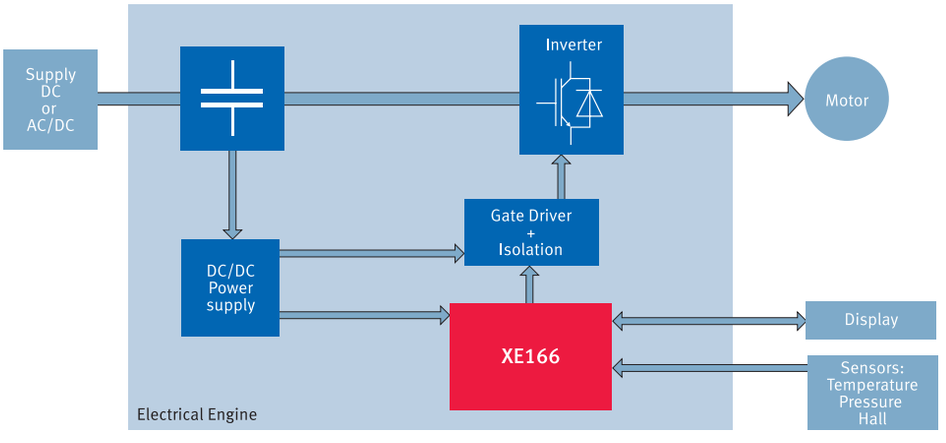
Power Converter Solutions AC/DC and DC/AC

- Locomotives
- Trains
- Subways
- Trams

Power Converter Solutions AC/AC

- Trolley busses
- Agricultural trucks
- Fork lifts
- Traffic lights

Application Example



Power Supplies

- UPS

Inverters
Rectifiers

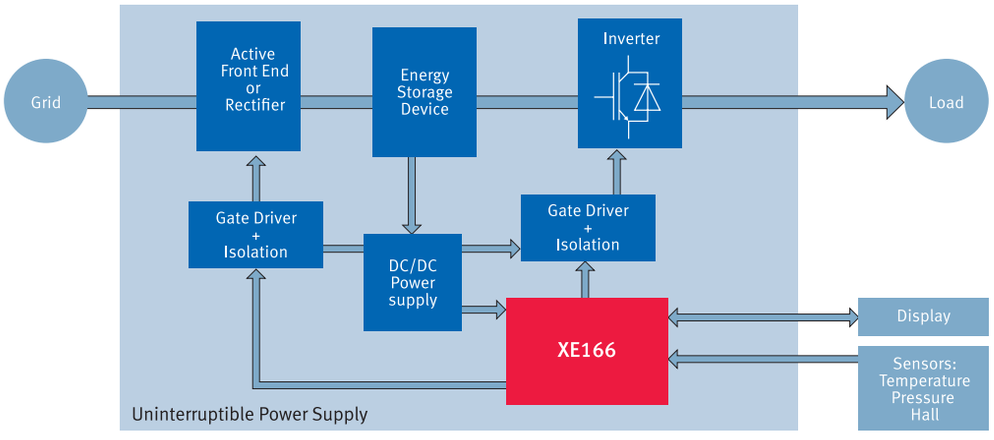
- SMPS
- Monitor/CTV
- PCs, servers

AC/DC

- Power supplies / VRM
- Telecom

DC/DC

Application Example

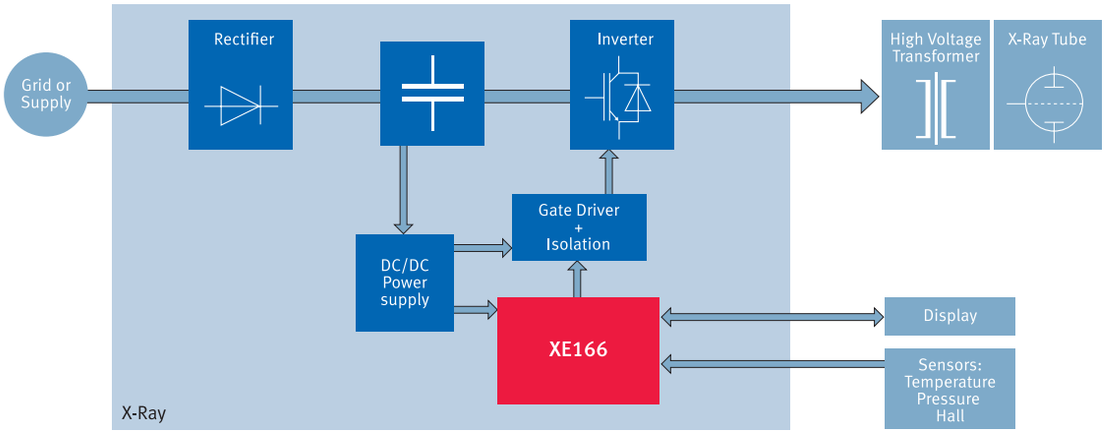


Medical

- X-ray machines
- Computer tomography
- MRT
- Power supply for medical equipment

Inverters
Rectifiers
DC/DC

Application Example

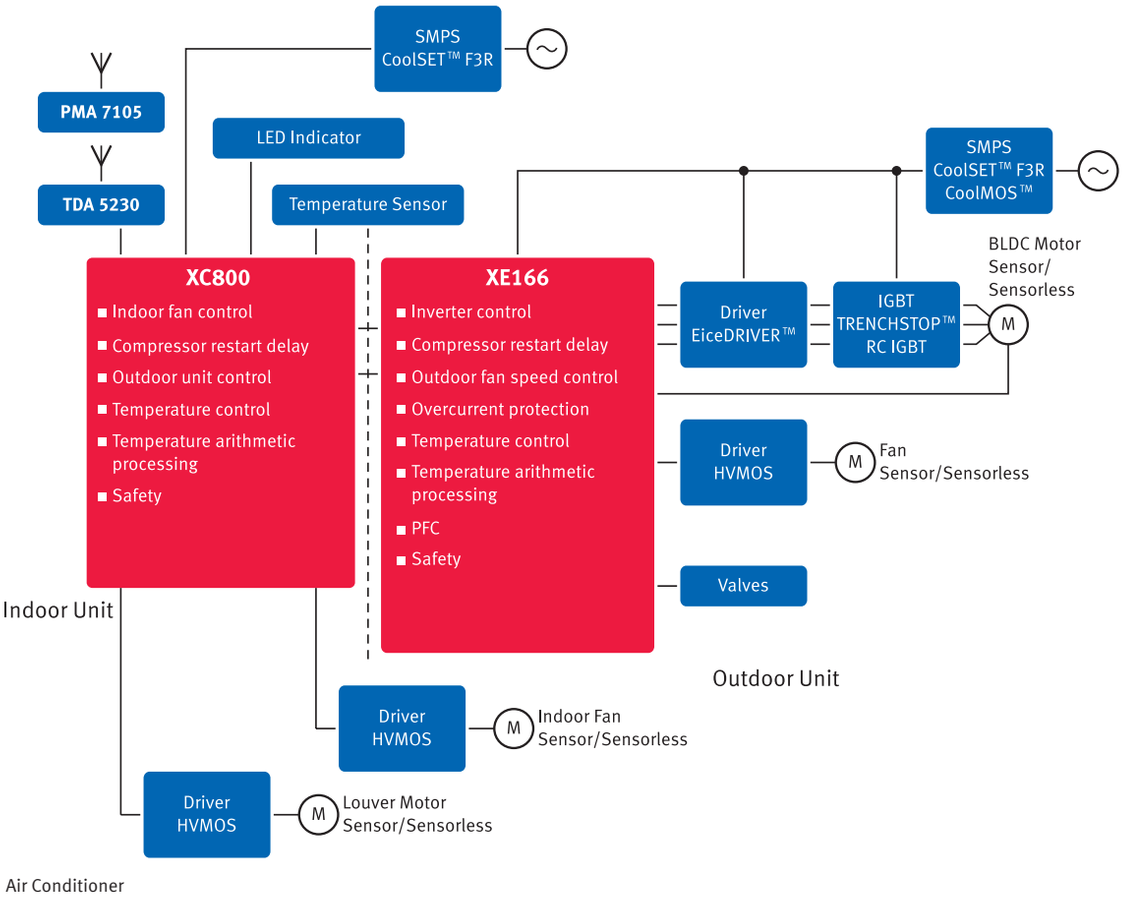


Building Control

Power Converter Solutions Motor Control

- Air conditioning systems
- Escalators
- Elevators

Application Example



Automation / Motor Control

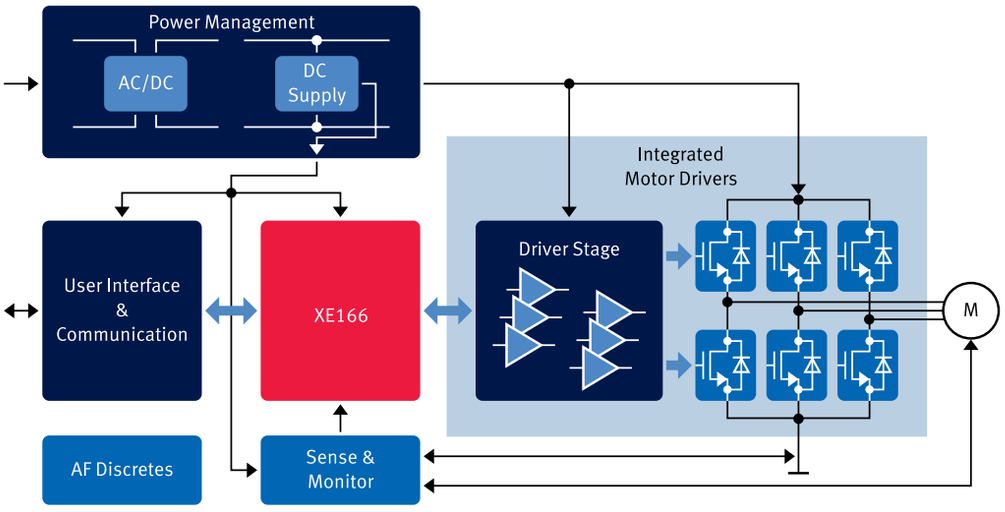
- Pumps and fans
- Compressors
- Air conditioning systems
- General purpose drives

Motor Control Solutions

- Servo drives
- General purpose drives
- CNC machines
- Process control
- Robotics

High-performance Motor Control Solutions

Application Example



Motor Control

Key Features

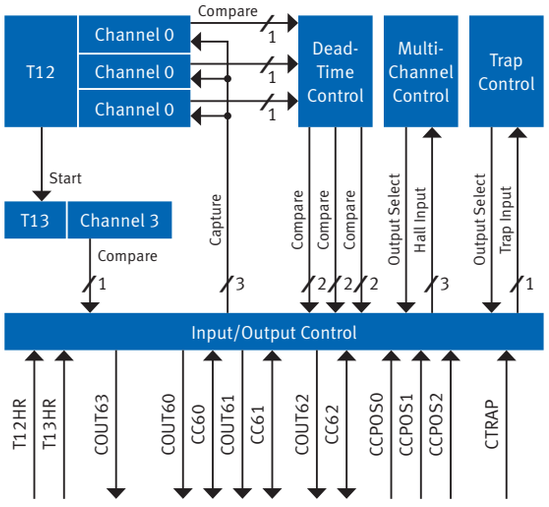
- Capture for time measurement
- Compare for PWM generation
- Burst for additional modulation
- Single-shot for flexible signal generation
- Multi-channel for unipolar machines
- Block communication for brushless DC drives

Peripheral Highlights

CCU6E Features

- Capture for time measurement
- Compare for PWM generation
- Burst for additional modulation
- Single-shot for flexible signal generation
- Multi-channel for unipolar machines
- Block commutation for brushless DC drives

CCU6E – High-Performance PWM

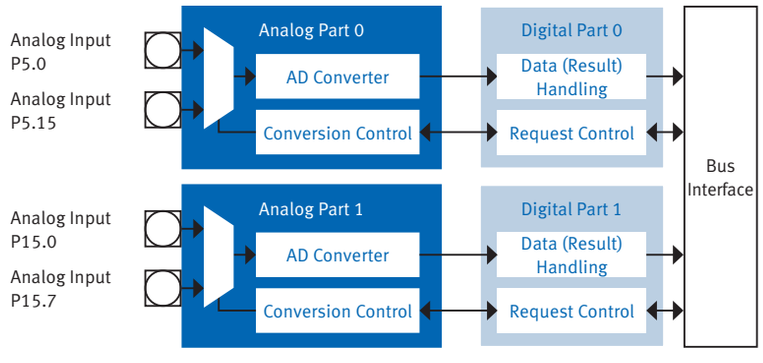


The Infineon CCU6E units consist of a T12 timer block with three capture/compare channels and a T13 timer block with one compare channel. The T12 channels can generate up to six PWM signals or accept up to six capture triggers. The T12 channels can be used to control up to three half-bridges with automatic dead-time generation. They can jointly generate control signal patterns to drive AC motors or inverters. Sinusoidal or space vector modulation can be easily implemented. Special operating modes support the control of brushless DC motors using hall sensors or back-EMF detection. Furthermore, block commutation and control mechanisms for multi-phase machines are supported.

Two Synchronizable A/D Converters with

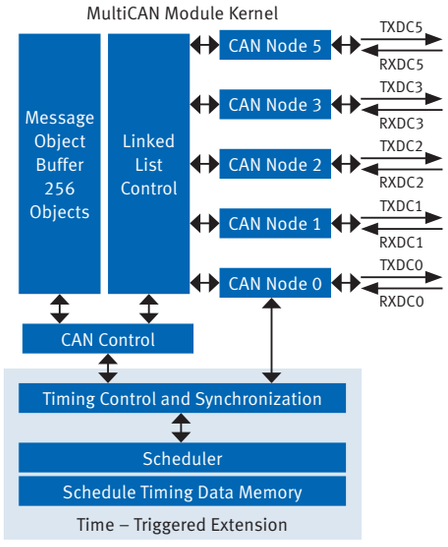
- Up to 30 channels
- 10 or 12-bit resolution, +/-2LSB
- Conversion time 600ns @ 80MHz
- Data reduction pre-processing
- Result accumulation, limit check
- External or internal trigger events and automatic conversion sequencing

Enhanced Analog-Digital Converter (ADC)



Enhanced Communication

MultiCAN



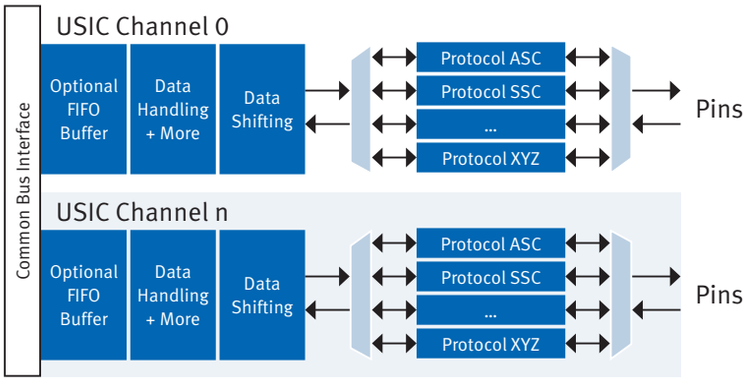
Complex applications increasingly require intelligent communication over the CAN network. A CAN gateway and a FIFO are only two examples of what can easily be implemented with XE166's enhanced MultiCAN module.

MultiCAN Features

- Full-CAN with CAN 2.0B active
- Up to 6 independent CAN nodes
- Up to 256 message objects
- Programmable acceptance filtering
- Powerful analysis capability
- FIFO data handling support
- Automatic gateway support
- Flexible interrupt handling

Universal Serial Interface (USIC)

Designers can now configure universal serial interfaces depending on their system requirements. Whether UART, SSC (SPI compatible), LIN, IIC or IIS, any interface is possible after a quick adjustment of the USIC module.



Each USIC Channel

- Is capable of handling UART, SPI, LIN, IIC and IIS
- Is individually configurable (incl. baud rate generation)
- Handles full duplex data transfers
- Is programmable Rx and Tx FIFOs
- Is reprogrammable on the fly without chip reset

A USIC Module is

- A cluster of two independent, identical USICs
- Available with up to three USIC modules (= six channels)

Independent Voltage Domains

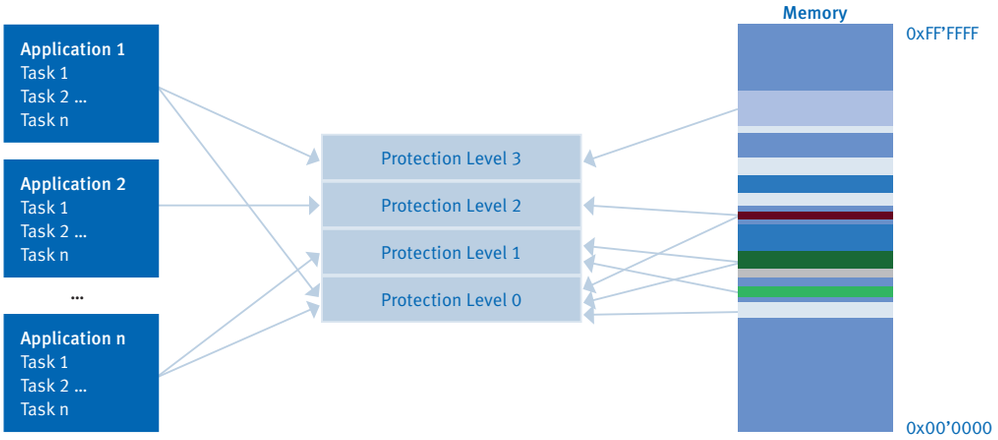
Embedded designers now have the flexibility to make use of two voltage domains that can be configured to maximize system performance. Digital functions are increasingly moving to lower voltages, while some analog functions still work best with higher voltage levels. The XE166 combines the best of both worlds, with the additional benefit of an embedded voltage regulator for core voltage generation.

XE166 Facilitates Two Independent I/O Domains

- I/O supply
- Flexible I/O voltage: 5.5V to 3.0V
- Users choose single or dual supplies (5.5V to 3.0V)
- Core supply
- On-chip regulator from I/O supply

Embedded Safety Features (Supporting SIL) for U, L, N, M and H-Series

Memory Protection Unit (MPU)



... used for code and data encapsulation

Four Protection Levels

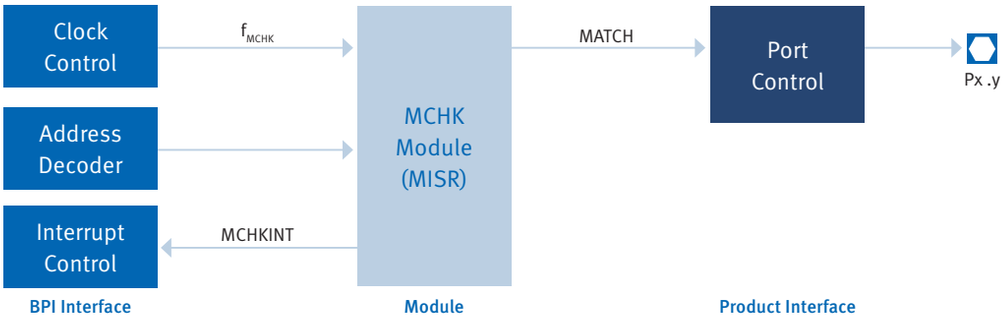
- One memory region can be assigned to several protection levels
- One application can be assigned to several protection levels

Protected Memory Regions

- Upper/lower bound (256Bytes granularity)
- Access rights (read, write, execute)
- 12 regions available
- Any address (including SFRs, XSFRs, I/O)
- Assigned to a protection level

All Violations can be Detected (supporting class B)

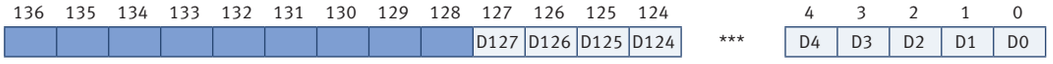
Memory Checker (MCHK, CRC)



... used for check memory content integrity

- Calculates a checksum of a block of data (CRC)
- Image in Flash, block of sensitive RAM data, transmitted data
- Generating pseudo-random numbers
- Programmable multi-input linear feedback shift register (MISR)

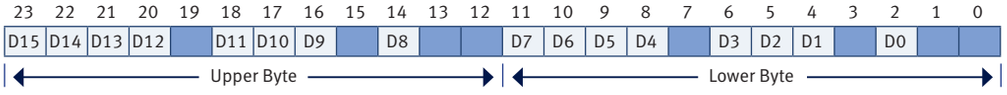
ECC for SRAM and Flash



... used for detection and correction of memory disturbs

Available on all Flash Memories

- 9-bit ECC on 128 bits of data
- 2-bit error detection and 1-bit correction per 128 bits
- Trap and interrupt generation in case of error detection



Available on Dedicated SRAMs

- 4-bit ECC; byte-oriented
- 1-bit error detection and 1-bit correction per byte
- Trap in case of error detection

Data bits
Error correction bits

A/D Conversion with Broken Wire Detection

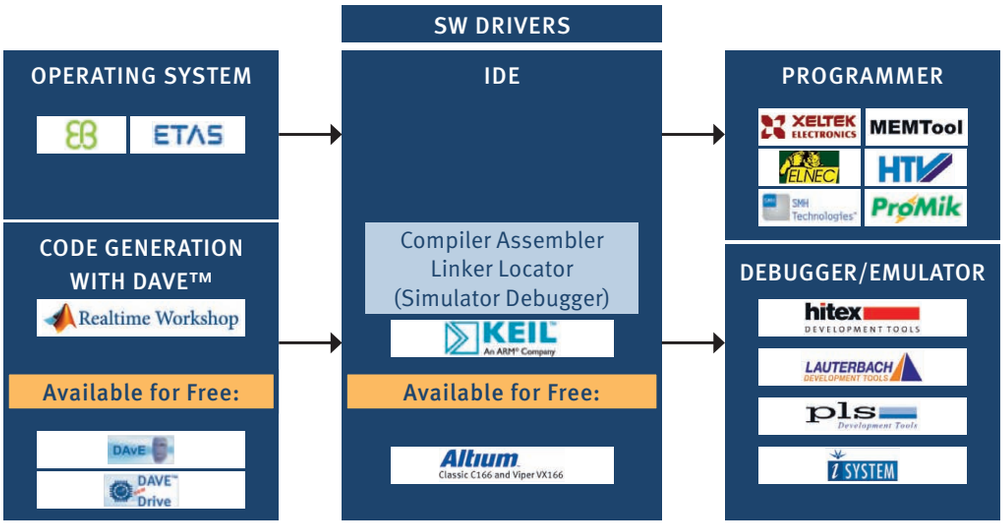
preparation (optional)	sample	conversion

- Optional preparation phase
- Preparation: precharge ADC cap with an “out of range voltage” of the sensor
- “Out of range voltage” can be any voltage on an ADC input channel

System Development Tools

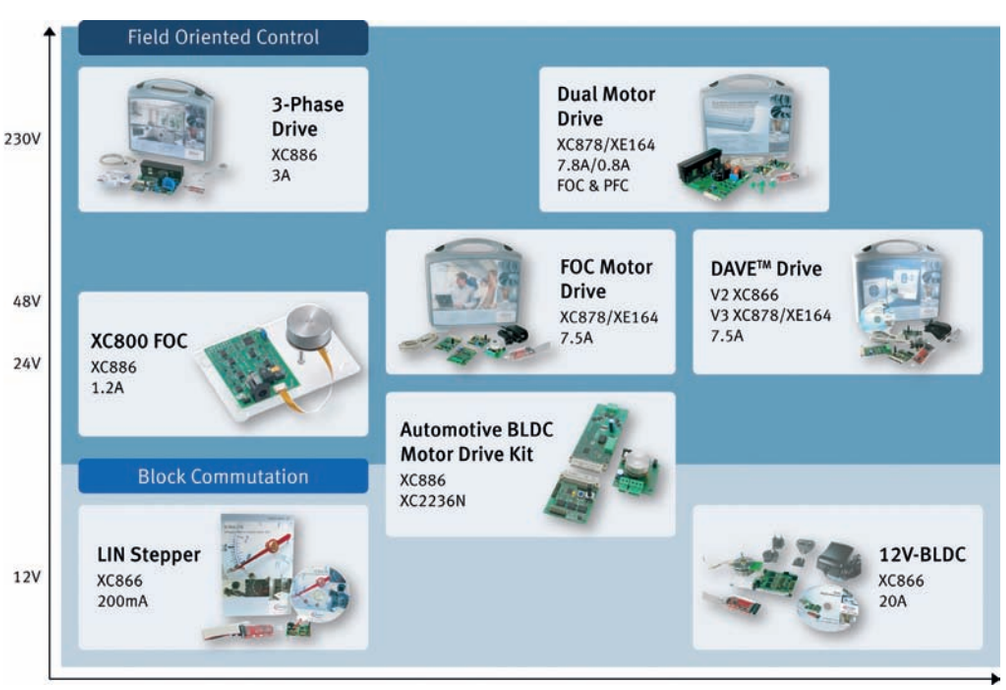
The XE166 family of real-time signal microcontrollers is supported by a variety of high quality and user-friendly toolchains from well-known Infineon tool partners. The following diagram shows the typical development toolchains. Our partners provide easy migration of existing toolchains and legacy code from XC / C166 to the XE166 family.

Development Tool Chain for XE166 Microcontrollers



Starter Kits and Evaluation Boards

Motor Control Application Kits



Starter Kits and Evaluation Boards

DAVE™ Drive Kit – Easy to Use Application Code Generator for Motor Control

Uses the full power of Infineon's microcontroller. For example, it generates optimized FOC code for XE166 using a Vector computer, something which usually requires expert knowledge in both motor control and assembler programming. By making DAVE™ Drive available as a free download, customers of all sizes can quickly implement advanced motor control techniques using Infineon's powerful components for motor control.

Key Features

- Motor types: BLDC, PMSM, induction motor
- LDC control algorithm:
  - Sinusoidal commutation: Sensorless Field Oriented Control (single shunt current measurement)
  - Trapezoidal commutation using Hall sensors and sensorless BEMF zero crossing detection
- Induction motor control algorithm:
  - V/Hz openloop speed control
- Microcontrollers:
  - 8-bit XC800: XC878CLM, XC888CLM, XC886CLM, XC866, XC864
  - 16-bit XE166 microcontroller series: XE164F (Classic Series), XE162FN (N Series), XE162FM (M Series)
- Flexibly generates optimized code and is not based on static libraries
- Supports user specific motor & power board configurations
- Configures Infineon's powerful and flexible motor control peripherals
- Includes user manuals & algorithm parameter calculations

Easy Kits – Designed for Ease of Use

One USB Cable for

- Power supply
- Virtual COM port
- Download & debug interface

The XE166 Easy Kit includes

- Easy Kit hardware
- Technical documentation, e.g. user manual, architecture manual, application notes, data sheets, board documentation
- Compiler, debugger, DAVE™ mother system, DIP files, memtool for Flash programming

Naming System

Prefix

Temperature Range
- F for -40/+85 °C
- K for -40/+125 °C

C166S V2 CPU

Enhanced 3/5 Volt IO More Memory

Pin-Out Type
- 0 for 38-pin
- 1 for 48-pin
- 2 for 64-pin
- 4 for 100-pin
- 7 for 144-pin
- 9 for 176-pin

Sub Family
- F for CAN, ADC, USIC
- G for CAN, reduced ADC, USIC
- H for ADC, USIC
- K for reduced ADC, USIC

Family
- H for High Line
- M for Base Line
- N for Value Line
- L for Econo Line
- U for Compact Line
- no letter for Alpha Line

On-Chip Code Memory (in Multiples of 8)
- 16 for 128KB
- 24 for 192KB
- 40 for 320KB
- 48 for 384 KB
- 72 for 576KB
- 96 for 768KB
- 136 for 1088KB
- 200 for 1600KB

Memory Type
- F for Flash

CPU Frequency
- 66 for 66MHz
- 80 for 80MHz
- 100 for 100MHz

Package
- L for LQFP
- V for VQFN
- R for TSSOP

Starter Kits and Evaluation Boards

DAP miniWiggler

The miniWiggler is Infineon's high-performance and cost-efficient debugging tool for the future. On the host side, it has a USB interface, which is available on every computer. On the device side, the communication goes over Infineon 10-pin DAP or 16-pin OCDSL1 interfaces. The miniWiggler has been designed especially to work in combination with Infineon's Debug Access Software (DAS). The latest DAS version can be downloaded at www.infineon.com/das

Applications

- Debug
- Flash programming

Supported Tools

- ALTIUM/Tasking Compiler
- DAVE™ Bench
- HiTOP HITEX
- KEIL uVision

Key Features

- Compatible with Infineon DAP and SPD
- Compatible with JTAG/IEEE 1149.1
- Clock rate up to 30MHz (programmable)
- All signals are 5.5V, scaling down to 1.65V
- USB 2.0 (high-speed)
- Certified drivers for Microsoft Windows 2000, XP and Vista
- USB, JTAG and DAP/SPD hotplug and unplug
- Three on-board status LEDs
- Support for OCDS1 16-pin and DAP 10-pin connectors

UConnect Ethernet/OLED Extension Board

Source Code includes

- PID controller
- Basic OLED graphics library
- uIP TCP/IP stack
- WEB server

Supporting Tools

- HiTOP
- Tasking Classic Compiler

Key Features

- 320*240 OLED 24-bit colors (connected at XE164 USIC via SPI)
- Ethernet controller (connected at XE164 USIC via SPI)
- Potentiometer
- Four push buttons
- CAN and UART connector
- Power supply

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Feature Overview XE166 Family

	Product Type	Max Clock Frequency (MHz)	Program Memory (KB)	SRAM (incl. Cache) (KB)	Coprocessor [1]	Digital I/O Lines	Number of ADC Channels	"Timed I/O Channels (PWM, CAPCOM, GPTA)"	External Bus Interface	CAN Nodes	Serial Interfaces [2]	Temperature Ranges [3]	Packages
Classic Series – Alpha Line													
XE164x	XE164K-96F66L	66	768	82	MAC	75	11	30	yes	-	4xUSIC	F	PG-LQFP-100
	XE164H-96F66L	66	768	82	MAC	75	16	37	yes	-	6xUSIC	F	PG-LQFP-100
	XE164G-96F66L	66	768	82	MAC	75	11	30	yes	2	4xUSIC	F	PG-LQFP-100
	XE164F-96F66L	66	768	82	MAC	75	16	37	yes	4	6xUSIC	F	PG-LQFP-100
	XE164F-96F80L	80	768	82	MAC	75	16	37	yes	4	6xUSIC	F	PG-LQFP-100
XE167x	XE167K-96F66L	66	768	82	MAC	118	16	30	yes	-	4xUSIC	F	PG-LQFP-144
	XE167H-96F66L	66	768	82	MAC	118	24	44	yes	-	6xUSIC	F	PG-LQFP-144
	XE167G-96F66L	66	768	82	MAC	118	16	30	yes	2	4xUSIC	F	PG-LQFP-144
	XE167F-96F66L	66	768	82	MAC	118	24	44	yes	5	6xUSIC	F	PG-LQFP-144
	XE167F-96F80L	80	768	82	MAC	118	24	44	yes	5	6xUSIC	F	PG-LQFP-144
U Series – Compact Line													
XE160x	XE160FU-4F66R	66	32	8	MAC	28	8	15	no	-	2xUSIC	F,K	PG-TSSOP-38
	XE160FU-8F66R	66	64	8	MAC	28	8	15	no	-	2xUSIC	F,K	PG-TSSOP-38
XE161x	XE161FU-4F66V	66	32	8	MAC	33	10	15	no	-	2xUSIC	F,K	PG-VQFN-48
	XE161FU-8F66V	66	64	8	MAC	33	10	15	no	-	2xUSIC	F,K	PG-VQFN-48
L Series – Econo Line													
XE161x	XE161FL-12F80V	80	96	12	MAC	33	10	21	no	1	4xUSIC	F,K	PG-VQFN-48
	XE161FL-20F80V	80	160	12	MAC	33	10	21	no	1	4xUSIC	F,K	PG-VQFN-48
	XE161HL-12F80V	80	96	12	MAC	33	10	21	no	1	4xUSIC	F,K	PG-VQFN-48
	XE161HL-20F80V	80	160	12	MAC	33	10	21	no	1	4xUSIC	F,K	PG-VQFN-48
XE162x	XE162FL-12F80L	80	96	12	MAC	48	19	21	no	1	4xUSIC	F,K	PG-LQFP-64
	XE162FL-20F80L	80	160	12	MAC	48	19	21	no	1	4xUSIC	F,K	PG-LQFP-64
	XE162HL-12F80L	80	96	12	MAC	48	19	21	no	1	4xUSIC	F,K	PG-LQFP-64
	XE162HL-20F80L	80	160	12	MAC	48	19	21	no	1	4xUSIC	F,K	PG-LQFP-64
N Series – Value Line													
XE162xN	XE162HN-16F80L	80	128	18	MAC	40	9	23	no	-	6xUSIC	F,K	PG-LQFP-64
	XE162HN-24F80L	80	192	26	MAC	40	9	23	no	-	6xUSIC	F,K	PG-LQFP-64
	XE162HN-40F80L	80	320	34	MAC	40	9	23	no	-	6xUSIC	F,K	PG-LQFP-64
	XE162FN-16F80L	80	128	18	MAC	40	9	23	no	2	6xUSIC	F,K	PG-LQFP-64
	XE162FN-24F80L	80	192	26	MAC	40	9	23	no	2	6xUSIC	F,K	PG-LQFP-64
	XE162FN-40F80L	80	320	34	MAC	40	9	23	no	2	6xUSIC	F,K	PG-LQFP-64
XE164xN	XE164KN-16F80L	80	128	18	MAC	75	11	30	yes	-	4xUSIC	F,K	PG-LQFP-100
	XE164KN-24F80L	80	192	26	MAC	75	11	30	yes	-	4xUSIC	F,K	PG-LQFP-100
	XE164KN-40F80L	80	320	34	MAC	75	11	30	yes	-	4xUSIC	F,K	PG-LQFP-100
	XE164HN-16F80L	80	128	18	MAC	75	16	30	yes	-	6xUSIC	F,K	PG-LQFP-100
	XE164HN-24F80L	80	192	26	MAC	75	16	30	yes	-	6xUSIC	F,K	PG-LQFP-100
	XE164HN-40F80L	80	320	34	MAC	75	16	30	yes	-	6xUSIC	F,K	PG-LQFP-100
	XE164GN-16F80L	80	128	18	MAC	75	11	30	yes	2	4xUSIC	F,K	PG-LQFP-100
	XE164GN-24F80L	80	192	26	MAC	75	11	30	yes	2	4xUSIC	F,K	PG-LQFP-100
	XE164GN-40F80L	80	320	34	MAC	75	11	30	yes	2	4xUSIC	F,K	PG-LQFP-100
	XE164FN-16F80L	80	128	18	MAC	75	16	30	yes	2	6xUSIC	F,K	PG-LQFP-100
	XE164FN-24F80L	80	192	26	MAC	75	16	30	yes	2	6xUSIC	F,K	PG-LQFP-100
	XE164FN-40F80L	80	320	34	MAC	75	16	30	yes	2	6xUSIC	F,K	PG-LQFP-100

F = -40 – 85 °C, K = -40 – 125 °C

Feature Overview XE166 Family

	Product Type	Max Clock Frequency (MHz)	Program Memory (KB)	SRAM (incl. Cache) (KB)	Coprocessor [1]	Digital I/O Lines	Number of ADC Channels	"Timed I/O Channels (PWM, CAPCOM, GPTA)"	External Bus Interface	CAN Nodes	Serial Interfaces [2]	Temperature Ranges [3]	Packages
M Series – Base Line													
XE162xM	XE162HM-48F80L	80	384	34	MAC	40	9	23	no	-	6xUSIC	F	PG-LQFP-64
	XE162HM-72F80L	80	576	50	MAC	40	9	23	no	-	6xUSIC	F	PG-LQFP-64
	XE162FM-48F80L	80	384	34	MAC	40	9	23	no	2	6xUSIC	F	PG-LQFP-64
	XE162FM-72F80L	80	576	50	MAC	40	9	23	no	2	6xUSIC	F	PG-LQFP-64
XE164xM	XE164KM-48F80L	80	384	34	MAC	76	11	30	yes	-	4xUSIC	F,K	PG-LQFP-100
	XE164KM-72F80L	80	576	50	MAC	76	11	30	yes	-	4xUSIC	F,K	PG-LQFP-100
	XE164HM-48F80L	80	384	34	MAC	76	16	37	yes	-	6xUSIC	F,K	PG-LQFP-100
	XE164HM-72F80L	80	576	50	MAC	76	16	37	yes	-	6xUSIC	F,K	PG-LQFP-100
	XE164GM-48F80L	80	384	34	MAC	76	11	30	yes	2	4xUSIC	F,K	PG-LQFP-100
	XE164GM-72F80L	80	576	50	MAC	76	11	30	yes	2	4xUSIC	F,K	PG-LQFP-100
	XE164FM-48F80L	80	384	34	MAC	76	16	37	yes	4	6xUSIC	F,K	PG-LQFP-100
	XE164FM-72F80L	80	576	50	MAC	76	16	37	yes	4	6xUSIC	F,K	PG-LQFP-100
XE167xM	XE167KM-48F80L	80	384	34	MAC	119	16	30	yes	-	4xUSIC	F,K	PG-LQFP-144
	XE167KM-72F80L	80	576	50	MAC	119	16	30	yes	-	4xUSIC	F,K	PG-LQFP-144
	XE167HM-48F80L	80	384	34	MAC	119	24	44	yes	-	8xUSIC	F,K	PG-LQFP-144
	XE167HM-72F80L	80	576	50	MAC	119	24	44	yes	-	8xUSIC	F,K	PG-LQFP-144
	XE167GM-48F80L	80	384	34	MAC	119	16	30	yes	2	4xUSIC	F,K	PG-LQFP-144
	XE167GM-72F80L	80	576	50	MAC	119	16	30	yes	2	4xUSIC	F,K	PG-LQFP-144
	XE167FM-48F80L	80	384	34	MAC	119	24	44	yes	5	8xUSIC	F,K	PG-LQFP-144
	XE167FM-72F80L	80	576	50	MAC	119	24	44	yes	5	8xUSIC	F,K	PG-LQFP-144
H Series – High Line													
XE167xH	XE167FH-136F100L	100	1088	138	MAC	98	24	60	yes	6	8xUSIC	F,K	PG-LQFP-144
	XE167FH-200F100L	100	1600	138	MAC	118	24	60	yes	6	8xUSIC	F,K	PG-LQFP-144
XE169xH	XE169FH-136F100L	100	1088	138	MAC	98	30	60	yes	6	10xUSIC	F,K	PG-LQFP-176
	XE169FH-200F100L	100	1600	138	MAC	118	30	60	yes	6	10xUSIC	F,K	PG-LQFP-176

www.infineon.com/XE166

F = -40 – 85 °C, K = -40 – 125 °C

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